

M E M O R A N D U M

TO: STAN BACH, DAVE BOCCHI, JEFF LAACKMAN
FROM: TIM CASADY
DATE: MAY 1, 1989
RE: PATENT APPLICATION: IMPLANTABLE N-PHASIC
DEFIBRILLATOR OUTPUT BRIDGE CIRCUIT

Ron Cohn has forwarded a first draft of a patent application based on your invention.

Would you kindly review the application. As you do this, keep in mind that no "new matter" or new inventive ideas, may be added to the patent application after it is formally filed. There is no need to retype this material. Instead, I would suggest you simply mark up the changes and return it to Barb Becker so that she can forward it on to Ron.

Attachment

T. Casady



CLAIMS

1. An output circuit for use in an implantable defibrillation system, said circuit comprising:

capacitor means for storing a predetermined voltage;

first and second switching means, both connected to said capacitor means and capable of being triggered to active conditions;

a ground-return terminal;

first and second electrode lead terminals connected to said first and second switching means, respectively;

third and fourth switching means connected to said first and second lead terminals, respectively, for selectively connecting said first and second electrode lead terminals, respectively, to said ground-return terminal when triggered to active conditions; and

triggering means for triggering said first and said third switching means to said active conditions to allow voltage stored by said capacitor means to discharge through said first and second electrode lead terminals in a first polarity, and for triggering said second and fourth switching means to said active conditions to allow voltage stored by said capacitor means to discharge through said first and second electrode lead terminals in a second polarity opposite to said first polarity.

2. The circuit of claim 1, and further comprising first and second push-pull driver circuits; first and second control pins connected to said first and second push-pull driver circuits, respectively; and first and second pulse transformers; said first and second pulse transformers including primary and secondary windings, said secondary windings being connected to said first and second switching means, said primary windings being connected to said push-pull driver circuits, and said first and second switching means being triggered to said active conditions by applying an electrical pulse to said first and second control pins.

3. An implantable defibrillation system for delivering mono-phasic, multi-phasic, and sequential defibrillation pulses to a heart via a pair of electrodes implanted on or about the heart, said system comprising:

an output circuit comprising capacitor means for storing a predetermined voltage, first and second switching means both connected to said capacitor means and capable of being triggered to active conditions;

a ground return terminal;

first and second electrode lead terminals connected, respectively to said first and second switching means and to said pair of electrodes;

third and fourth switching means for selectively connecting said first and second electrode lead terminals,

respectively, to said ground return terminal when triggered to active conditions;

a control circuit for selectively triggering said first and said third switching means to said active conditions for allowing voltage stored by said capacitor means to discharge through said first and second electrode lead terminals in a first polarity, and triggering said second and fourth switching means to said active conditions for allowing voltage stored by said capacitor means to discharge through said first and second electrode lead terminals in a second polarity opposite to said first polarity.

4. A method for generating a multi-phasic defibrillation pulse via four independently controlled electrical switching elements for delivery to the heart of a patient via first and second electrodes implanted on or about the heart, said method comprising the steps of:

charging a capacitor to a predetermined voltage;

triggering a first electrical switching element connected to said capacitor and said first electrode to an active condition and triggering a third electrical switching element connected to said second electrode and a ground terminal to an active condition for delivering voltage through said first and second electrodes to the heart in a first polarity;

triggering a second electrical switching element connected to said capacitor and said second electrode to an active

condition and triggering a fourth electrical switching element connected to said first electrode and a ground terminal to an active condition for delivering voltage through said first and second electrodes to the heart in a second polarity opposite to said first polarity.

5. An implantable defibrillation system for delivering mono-phasic, multi-phasic and sequential defibrillation pulses to a heart via a pair of discharge electrodes implanted on or about the heart, said system comprising:

sensing electrode means mounted on or about the heart;

arrhythmia sensing means connected to said sensing electrode means for detecting an arrhythmia of the heart;

an output circuit comprising capacitor means for storing a predetermined voltage; first and second switching means connected to said capacitor means and said discharge electrodes, and capable of being triggered to active conditions; a ground return terminal; first and second electrode lead terminals connected, respectively, to said first and second switching means and to said pair of electrodes; third and fourth switching means for selectively connecting said first and second electrode lead terminals, respectively, to said ground return terminal when triggered to active conditions;

control means for selectively triggering said first and said third switching means to said active conditions for

allowing voltage stored by said capacitor means to discharge through said first and second electrode lead terminals in a first polarity, and triggering said second and fourth switching means to said active conditions for allowing voltage stored by said capacitor means to discharge through said first and second electrode lead terminals in a second polarity opposite to said first polarity.



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*Has received an application for a patent
for a new and useful invention. The title
and description of the invention are en-
closed. The requirements of law have
been complied with, and it has been de-
termined that a patent on the invention
shall be granted under the law.*

Therefore, this

United States Patent

*Grants to the person or persons having
title to this patent the right to exclude
others from making, using or selling the
invention throughout the United States
of America for the term of seventeen
years from the date of this patent, sub-
ject to the payment of maintenance fees
as provided by law.*

Harry F. Manbeck, Jr.

Commissioner of Patents and Trademarks

Priscilla A. Fuller

Attest

NOTICE

If the application for this patent was filed on or after December 12, 1980, maintenance fees are due three years and six months, seven years and six months, and eleven years and six months after the date of this grant, or within a grace period of six months thereafter upon payment of a surcharge as provided by law. The amount, number, and timing of the maintenance fees required may be changed by law or regulation.